

## Science advice: an abuser's guide

**Most politicians claim that they recognise the value of advice from scientists and technologists. But is the advice worth anything when weighed in the scales of politics?**

Susan Watts

**I**N AN ideal world, politicians would turn to scientists every day for advice on the choices facing government. These might concern the felling of rainforests in Brazil and Africa, and all that this implies for the greenhouse effect; the side effects of a new drug; the long-term action of pesticides; or how best to exploit oil from the North Sea or the Gulf of Mexico.

In this ideal world, policy makers might expect their scientific advisers to provide facts before opinions. They would demand the objective information they need to formulate policy. In the real world, scientific advice is wide open to abuse, both by the scientists themselves, who have vested interests, and by governments, which can seek to use science for political ends.

But should scientific advisers be excluded from the machinations of politics? Scientists who are kept apart from the considerations and arguments of politicians are often less likely to be effective in guiding the policies of the day. "The scientist in a cupboard, consulted only when others think this is necessary, will be useless," says Hermann Bondi, former chief scientific adviser to Britain's Department of Energy and Ministry of Defence.

Bondi was one of a group of leading politicians and scientific advisers of the past and present brought together last

December for a forum on "Science and Government" at the Weizmann Institute of Science, one of Israel's leading research establishments. Everyone agreed that scientists do not fit easily into the process of government. Scientists and politicians are different animals and each finds it hard to understand the other. They work at different paces; the scientist tackles a problem over many years, the politician must make decisions every day. Politicians often expect easy answers from scientists. They rarely recognise that scientists can be inconsistent. "The politician may imagine that in real life, as in a school textbook, there is one answer to every question, preferably given at the back of the book," says Bondi.

According to David Beckler, chief of staff to the science advisers of six American presidents, the range of scientific views on most issues facing government can be represented by a bell curve. When scientists agree, for instance on the potential of cold fusion energy, the curve is steep and politicians can easily identify mainstream views from those on the fringe. For an issue such as the effects of potential carcinogens based on tests on animals, the bell curve flattens and politicians have trouble identifying a majority view.

At times of crisis, real and imagined, politicians need the help of technical and scientific minds. They will seek guidance on the best technical response to a critical political challenge.

The American government set up the National Research Council largely because of weaknesses in technology exposed by the First World War. In peace time, the desire for scientific advice can be just as intense if a government perceives a threat of sufficient magnitude on the political horizon. To the US, one such threat was the Soviet launch of the Sputnik satellite in 1957.

Sputnik was enough of a shock to make President Dwight D. Eisenhower wish he had been better informed. Since the end of the Second World War, the presidents had ignored calls to appoint a science adviser. The Soviet launch made him realise how isolated he was from his own government's research programmes and, in particular, how little he knew about the poor progress of the American rival to Sputnik, Vanguard. Meanwhile, according to Jerome Wiesner, Special Assistant for Science and Technology under presidents John Kennedy and Lyndon Johnson, many scientists were still willing to defend the ailing Vanguard programme despite its



*Mild abuse: Ben-Gurion dismissed scientists and their explanations of the genetic code*

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**'The scientist in a cupboard, consulted only when others think this is necessary, will be useless'**

*Hermann Bondi, Britain*

record. The result was that, in 1957, Eisenhower set up the President's Science Advisory Committee (PSAC), putting a scientific adviser in the White House for the first time.

In Britain, the Prime Minister, Margaret Thatcher, chairs a group of departmental ministers with scientific interests. The group is designed to help to improve the day-to-day decision making of her government, but it meets infrequently. Thatcher usually seeks wider scientific advice only on an issue of burning political importance. This happened early last year when she convened a meeting for top scientists and environmentalists to discuss the greenhouse effect. The gathering at Chequers, the premier's country home, was a rare event because Thatcher prefers to consult a select network of personal advisers rather than the broader scientific community (see Box).

When scientific advice is available, governments have been known to use it wisely. In the US, the period of Eisenhower, Kennedy and Johnson, from 1953 to 1969, is regarded as the heyday of presidential science advice. Although the process was usually informal, and varied with the style of the president, the PSAC managed to identify weaknesses in the nation's science and technology in many fields.

In materials science, says Wiesner, the committee found evidence that the steel being produced by industry was weak and easily corroded. It discovered that semiconductors were often not pure enough for advanced applications. The committee called for stronger government support for materials research, and won. Staff in various government agencies could also appeal to members of the PSAC to investigate

alleged misuses of scientific advice. Cyrus Vance, a former US Secretary of State, told a session of the Weizmann meeting that the PSAC's advice was instrumental in redesigning American naval strategy, and that it strongly influenced the nation's policy towards the design of weapons.

The presidents took PSAC's advice to heart, usually overriding the recommendations of scientific advisers in the individual departments. For example, the committee concluded that biological warfare was not an effective weapon of war, largely because of fears over controlling the biological agents once released. The joint chiefs of staff disagreed, but the US Secretary of Defense supported the committee and overruled the critics.

Until the PSAC's demise under Richard Nixon's presidency, one of the committee's main strengths was its use of specialist groups to produce reports that the entire committee reviewed when drafts were about half complete. This helped to eliminate special pleading from scientists. The PSAC's success, and its eventual closure, inspired Congress—largely at the instigation of the scientific community—to set up the Office of Technology Assessment in 1972. The OTA provides

**'I wish I had not testified on supersonic transport. I did not think that my testimony would destroy the President's Science Advisory Committee'**

*Richard Garwin, US*

Congressional committees with their own source of technical reports and advice.

The office now has an annual budget of about \$16 million. Reports from the OTA are analytical and neutral; they are not supposed to contain recommendations. These reports are prepared by advisory committees, and include the major economic, legal and ethical considerations, as well as scientific points of view. They offer options, and evaluate the advantages and disadvantages of each argument. In general, the OTA is seen as a success story both by the scientific

community and by policy makers.

Success stories are more difficult to find in the way the British parliamentary system uses science advice. An exception to this is the work of the select committees of MPs in the House of Commons and peers in the House of Lords. These committees produce valuable reports on subjects ranging from industrial competitiveness to food irradiation. The government might also set up one-off committees for the purpose of gathering evidence on a specific subject. One successful example is the four-strong committee appointed in 1988 to produce guidelines on the use of human fetuses in research. The committee, chaired by John Polkinghorne, a particle physicist at the University of Cambridge, canvassed a broad spectrum of scientific opinion on the viability of the recent science, its limitations and implications. In the end, the committee decided to base its guidelines for fetal research on ethics rather than on science. But it was only by involving scientists in its early investigations that the committee was able to focus its agenda in this way. The government implemented all of the guidelines recommended by the Polkinghorne committee.

Some scientists regard the action by the British government over the threat of legionnaires' disease as further proof that politicians can make sensible use of scientific advice. The Parliamentary Employment Committee investigated the outbreak of the disease at the central London headquarters of the BBC in April 1988. The committee questioned the Health and Safety Executive: it wanted to know why the executive was not doing more to protect the public. Government took heed of the committee, and the HSE has now introduced statutory controls on owners of buildings, and it is rewriting its guidelines on the disease.

But politicians cannot always be relied upon to recognise the value of consulting scientists. James Curlin, who manages the OTA's communications and information technology programme, says he doubts that scientific advice has an impact on US presidents. "Are chief executives really interested? I cannot conceive of a president of the US sitting down for several hours and making decisions based on weighty scientific advice. They rely on skimpy documents. Decisions are still made on a political basis," he said at the Weizmann forum. "There will always be a scientist around who will back up whatever is decided."

Curlin emphasised his point. In spite of the sophisticated



*Serious abuse: Alfonsin cast scientists as puppets of politics*

**'Before Chernobyl, the people responsible for the development of nuclear energy said that economic reasons were more important than scientific ones'**

*Yuri Ossipyan, USSR*

on an anti-ballistic missiles project and on the possibilities of super sonic transport (SST). Both projects enjoyed Nixon's hearty support. When the PSAC published its reports, which were less than enthusiastic, Nixon shut down the committee.

The committee testified that for both projects, the value to the nation, either through its military establishments or through civilian uses, was minimal. For SST, the committee found that the project was potentially damaging to the environment because it would help to destroy the ozone layer.

According to Beckler, Nixon was not interested in the scientific arguments: "It was nothing to do with economics or environmental hazards—it was a matter of political prestige. Nixon wanted the first supersonic plane to have an American flag on it."

According to Richard Garwin, adviser to several American presidents on military technology and arms control, scientists are often naive when it comes to recognising the political impact of their actions. At the forum in Israel, Garwin stated publicly for the first time that he now feels he may have made a mistake in testifying against SST. "I did not think that I would destroy PSAC by testifying. But let me state here what I have never stated explicitly before—that of course I wish I had not testified on the SST."

But American scientists are not alone. According to Yuri

process of science advice that aims to inform both the president and Congress, he argues that it is still vital for scientists to jockey to get a paragraph in the president's annual statement to the nation, the State of the Union Address. Curlin said that a presidential paragraph gives scientists the excuse to lobby government agencies for financial support. Ronald Reagan's mention of the proposed Space Station gave scientists at NASA the go-ahead to ask for government money.

Sometimes the blind attitude of governments to scientific advice can be amusing. Ephraim Katzir, a former president of Israel and now professor of biophysics at the Weizmann Institute, entertained delegates with the story of how he tried to explain to David Ben-Gurion, the first prime minister of Israel, that the genetic code comprises just four basic elements. According to Katzir, Ben-Gurion listened and then pronounced that it could not be true: "'God does not work in this simple a way,' he said."

In other cases such ignorance can be more serious. In the early 1970s, when Richard Nixon was president, the PSAC produced reports

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Ossiyan, vice-president of the National Academy of Sciences in Moscow, Soviet scientists also find their views ignored or overruled by politicians. Although the USSR has historically revered science above almost every other profession, he said the academy was not consulted when the state was selecting a design for its nuclear reactors during the 1960s. Members of the state's energy board, concerned primarily with saving money rather than safety, went for the design that ultimately failed so catastrophically at Chernobyl in April 1986, noted Ossiyan. "The academy knew before the Chernobyl accident that the form of reactor chosen was not good."

The academy had recommended that the authorities build reactors with protective towers. The idea was turned down because it would have doubled the cost of the reactors. "The people responsible for the development of nuclear energy said that economic reasons were more important than scientific ones," said Ossiyan.

Scientific and technical advice fare no better in a country under military leadership. The military rulers of Argentina, who have run the country for much of the past 40 years, considered themselves experts in their own area, but felt vulnerable when it came to science and technology. These leaders would seek out scientists to fill the gap, but they chose only those who were prepared to justify the leaders' policies. If one "respected" group of scientists did not support the



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Science advisers have dismissed biological warfare as ineffective

military's ideas, the government would find another that did. Virginia Gamba-Stonehouse, former adviser to the joint chief of staffs at the Argentine Ministry of Defence, told how this distortion continued after the arrival of democratic rule in 1983, under the presidency of Raul Alfonsin.

Alfonsin placed technocrats at the head of his ministries of

## Who will tell the Prime Minister?

**T**HE BRITISH premier, Margaret Thatcher, has a diverse range of scientific advice at her disposal. Among her Policy Unit, the team of personal advisers based at Downing Street, is George Guise, a particle physicist and former industrialist. Other personal advisers include Crispin Tickell, Britain's ambassador to the United Nations, on environmental subjects, and George Porter, president of the Royal Society, on wider scientific issues.

Thatcher's second tier of advice comes from the government's Chief Scientific Adviser, John Fairclough, an industrialist on secondment from the computer manufacturer, IBM. Fairclough runs a large team of specialists to provide thorough briefings, and must service the whole of government. But, despite his title, he has less influence with Thatcher than her personal advisers.

Outside her personal circle and government, Thatcher turns to the Advisory Committee on Science and Technology, an organisation dominated by industrialists. In particular, she turns to the ACOST chairman, Francis Tombs, for advice on industrial policy. Tombs, a mechanical and electrical engineer, is chairman of Rolls-Royce.

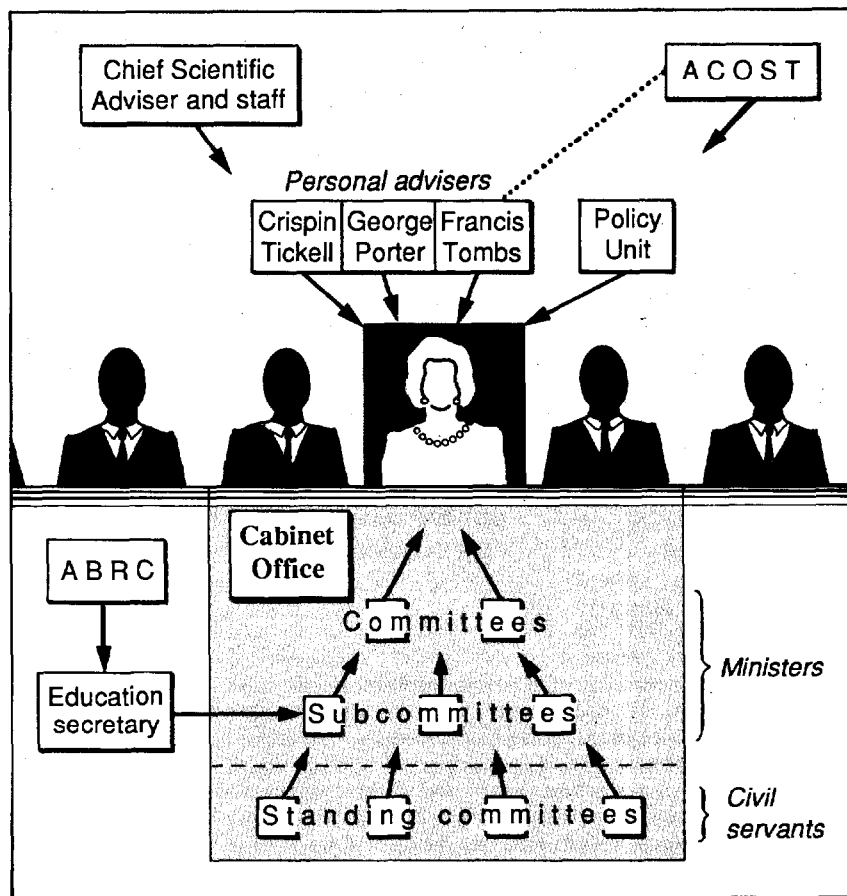
Less frequently, Thatcher goes to the Advisory Board for the Research Councils, which coordinates the work of Britain's five research councils. Ordinarily, the ABRC must channel its views through the education secretary, who participates in the ministerial sub-committees and committees of the Cabinet Office. These gatherings, convened to look at specific issues such as education or the environment, are informed by permanent, or standing, committees of civil servants in the Cabinet Office.

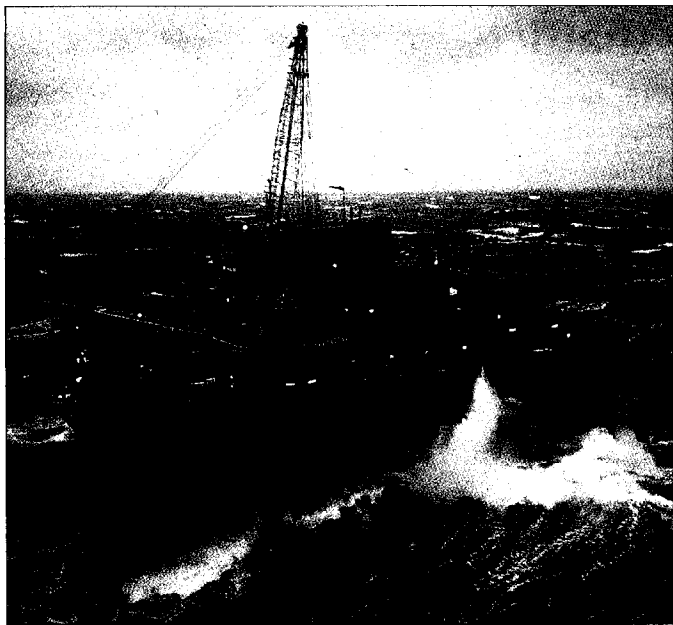
Thatcher has also tried to coordinate

government policy on science and technology by chairing a group of departmental ministers with an interest in the field. The group meets infrequently.

Chief scientific officers in each of the

government departments have little influence on the premier. She tends to turn to them for the facts to underpin an issue, but asks one of her personal advisers to pen the speech. □





J.W. Sherriff/Tony Stone

*Politicians need guidance in the turbulent world of energy*

economics, foreign affairs and defence "but these scientists were used as symbols only", said Gamba-Stonehouse. "The politicians believe that it is only by showing a commitment to technology that the powerful nations of the world will talk to them." She highlighted the way that Alfonsín became suspicious of the need for an atomic energy programme in his country, and tried to scale it down. Later, as a result of new scientific and economic ties with Brazil, he began to rebuild Argentina's atomic energy research programme. According to Gamba-Stonehouse, a programme that should have had a firm basis in scientific validity has instead become a focus of nationalistic fervour, because it shows that at least one area of high technology is open to the country, she said.

David Owen, British foreign secretary in the late 1970s, argued that scientists will also fight to protect their own interests. In 1977, during the negotiations for a ban on the testing of nuclear weapons, a group of scientists campaigned vociferously against a treaty. These scientists, who included researchers at the Los Alamos National Laboratories, New Mexico, where much of America's research on nuclear weapons takes place, felt that a ban would threaten their jobs, said Owen. They insisted that they had to test nuclear stockpiles for reliability, although the government's own scientific advisers found that no one had ever carried out such tests before. The scientists also said that they needed to carry on testing in order to build safer bombs. Owen recalled: "Fortunately two senior independent-minded scientists, Herbert York in the US and Solly Zuckerman in Britain, felt able to challenge the views of the scientists against a test ban." The opponents of the ban worked with sympathisers within the armed forces to try to circumvent the politicians. "They operated within the bureaucracy with all the tenacity and tendentiousness of the committed politician," said Owen.

Bondi cited another instance where scientific advice may well have been tainted by the motives of the scientists involved. This was the row in Britain last year, in the run-up to privatisation of the electricity industry, over the cost of decommissioning the country's ageing Magnox nuclear reactors. According to Bondi, the United Kingdom Atomic Energy Authority, which welcomed privatisation, had a vested interest in playing down the difficulty of decommissioning these reactors. In fact, neither the UKAEA nor the Central Electricity Generating Board had worked out the true cost of

decommissioning. The UKAEA had not done so because it was not its job to dismantle old commercial reactors; the CEGB because it would be up to 100 years before the board would have to tackle the most difficult part of the exercise. When the two bodies worked out the realistic costs of decommissioning for the government, they discovered that the job would be far more expensive than either had previously suggested—so high in fact that the government decided to withdraw nuclear reactors from the sale of the industry.

In the end, the forum at the Weizmann Institute decided that no one gives objective scientific and technological advice. The delegates concluded therefore that analysis should look at more than one option; factual findings, where possible, should be distinguished from value judgments. They also said that the scientific evidence on which governments make decisions must be made public. Issues such as the existence of more than 60 000 nuclear weapons in the world, the AIDS epidemic and potential global environmental catastrophe should not be discussed behind closed doors, said Garwin.

He quoted Richard Feynman, the late physicist. Drawing on Feynman's report on the Challenger disaster, Garwin suggested that the word "NASA" in Feynman's text should be replaced by "government". Feynman had written: "NASA owes it to the citizens from whom it asks support to be frank, honest and informative, so that these citizens can make the wisest decisions for the use of their limited resources. For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled." □

**Further reading:** an overview of the forum "Science and Government", held at the Weizmann Institute of Science, Israel, in December 1989, will be included in the forthcoming book *World Science and Technology Advice to the Highest Levels of Government*, by William Golden. An edited version of the proceedings will be published later this year.



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